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JAPANESE SPONGES.

Studies on the Hexactinellida. Contribution I. (Euplectellidæ). By Isao Iijima. Pp. 299; 14 plates. (Reprinted from the *Journal of the College of Science*, Imperial University, Tôkyô, Japan, vol. xv. 1901.)

THIS important memoir is the first instalment of a general monograph of the rich Hexactinellid fauna of the Japanese seas, upon the study of which the author has been engaged for the last seven years, with the result of increasing very largely the list of these interesting and beautiful sponges known to occur in that part of the world. Four species of *Euplectella*, three of *Regadrella* and one of *Walleria* are here described in great detail, and all but two of them are species described and named by the author himself, either in previous publications or in this memoir for the first time. The part of the work, however, which above all claims the attention of the zoologist who is not specially interested in this group of animals, or in the faunistic problems which attach to them, is the detailed account of the histology and organisation of *Euplectella marshalli* (pp. 116-200). The author has had at his disposal a very abundant material of this sponge, which he was able to preserve by various methods directly after capture. As the result of his careful studies upon this valuable material, the author describes in these Hexactinellids a type of structure which is radically different in two main points from that of all other sponges, and in both respects probably to be regarded as more primitive.

In the first place, he finds no trace of the intercellular matrix or mesogloea of the connective tissue parenchyma, which in other sponges forms the chief mass of the sponge body. In the second place, perhaps in consequence of the absence of any such ground substance, there is no layer of flat epithelium to be found on any part of the sponge body, neither on the external surface nor in the canal system.

The dermal layer, in short, forms in these Hexactinellids a system of trabeculae, composed of fused cells corresponding to the collencytes of other sponges, which here form a continuous protoplasmic syncytium with scattered nuclei. In this syncytium the spicules are laid down, but there is no secreted matrix apart from them and from the protoplasm of the syncytium, nor is there any flat epithelium covering the exposed surfaces. The trabeculae anastomose and form a cobweb-like felt-work, through which the water filters both before and after traversing the flagellated chambers. At the external and internal surfaces of the body wall the trabeculae are expanded to form film-like membranes perforated by numerous gaps or pores, the so-called dermal and gastral membranes. In the trabecular system are found other cellular elements, the archæocytes, with their modifications into nutritive and reproductive elements.

If the author's observations are confirmed, therefore, the Hexactinellids stand on a lower plane of evolution, at least as regards histological structure, than any other sponges, in that the dermal layer forms only one category of cell elements and is not differentiated into separate

epithelial and connective tissue strata. This conclusion, it is hardly necessary to point out, is in direct antagonism to the view, still maintained by many authorities, according to which these two commonly found differentiations of the dermal layer are to be regarded as an "ectoderm" and a "mesoderm" respectively. In the author's words, the Hexactinellids "are a group of sponges which have undergone a far-reaching development and differentiation in the spicules, but have remained in a primitive condition so far as certain points in the soft parts are concerned."

The author has also made a number of important observations upon other points of microscopic structure. He brings forward the first observations yet made upon the formation of spicules in these sponges. He has also observed "archæocyte congeries" which he believes to give rise to free larvæ, thus reverting to, and supporting, the view of H. V. Wilson, that many sponge larvæ are really free-swimming gemmules, and are not egg-larvæ. But the account given of the collar cells and flagellated chambers merits special mention, as differing in some points, both important and unimportant, from Schulze's recently published description of the collar cells in another Hexactinellid, *Schaudinnia arctica*. Each collar cell has a flattened basal portion containing the nucleus and running out into ramifying processes, which anastomose with those of neighbouring cells to form the "reticular membrane" of Schulze. According to Iijima, all the meshes of the reticular membrane are open and serve as prosopyles or chamber pores, which are therefore practically equal in number to the collar cells themselves, "converting the epithelium into a veritable sieve membrane." The trabeculae of the dermal layer attach themselves directly to the reticular membrane. The "polyprosopylar" condition here described contrasts sharply with what is seen in other sponges, and in the author's opinion it is correlated with the absence of mesogloea. In sponges other than Hexactinellids, *i.e.* in Calcarea and Demospongiae, the copious deposit of the ground substance round the bases of the collar cells necessarily blocks the free infiltration of the water between them, and causes a specialisation of the prosopyles; they become few in number and restricted in distribution, while between them the collar cells close up their ranks and extinguish the gaps in the wall. In Calcarea at least, it may be added, the prosopyles are further guarded, each by a special cell or porocyte of the dermal layer. These porocytes have not as yet, however, been demonstrated to occur in Demospongiae, and their existence in Calcarea is, perhaps, a peculiarity of this group alone.

The histological facts brought forward by the author throw a flood of light upon the nature of the prosopyles or primitive pores of sponges, and if carried back in imagination to the primitive vase-like Olynthus form, which was probably the ancestor of all sponges, they permit of interesting speculations as to the probable structure of the body wall in such a form. The earliest type of sponge must be pictured as entirely without mesogloea, and with a thin basket-like wall perforated by very numerous pores or interstices, corresponding to the intervals between the collar cells. The first advance towards strengthening this fragile structure would have

been the secretion of spicules, formed by cells, probably at first very few in number, of the dermal layer, which continually increased in numbers and in importance, not only for the better support and protection of the sponge body and in particular of the reproductive cells, but also, perhaps, for entangling and capturing the nutritive particles brought by the water current. Clearly, so delicate an organism could only maintain its existence in tranquil water. The ancestors of the Calcareo and Demospongiæ, by the development of a thick and often very tough mesogloea and a highly differentiated dermal layer, attained to the degree of firmness necessary for life in the littoral zone. The Hexactinellids, with a more primitive type of histological structure, have retained also their ancient deep-sea habitat.

Enough has been said to show the important results of Prof. Iijima's researches. We may add that the plates accompanying the work are a credit, not only to the author, but also to Japanese lithography. We shall await further instalments with much interest. E. A. MINCHIN.

INSTRUCTION IN VILLAGE SCHOOLS.

Rural Readers. Book I. By Vincent T. Murché. Pp. 168. (London: Macmillan and Co., Ltd., 1901.)

The Teacher's Manual of Object Lessons for Rural Schools. Books I. and II. By the same author. Pp. 231 and 252.

THESE books have been written by the headmaster of the Boundary Lane Board School, Camberwell, to meet the requirements of teachers in rural schools as laid down in the suggestive circular recently issued by the Board of Education. Mr. Murché claims to be an old hand at rural education, and the books before us certainly bear out his claim. If properly used, teachers will find them most valuable guides in introducing nature study into elementary schools. Their value is so much dependent on their mode of use that the author's caution, as given in the preface, must be kept well in mind. He says,

"These books are not intended to form a rigid cast-iron scheme of lessons, to be blindly followed by every teacher into whose hands they may fall. They are rather to be considered as a store-house from which the teacher may draw, to suit his own special conditions; and further, the ample provision of subjects in each volume will enable him for years to construct scheme after scheme, all of them dealing with just those subjects which will appeal to country children."

A brief summary of the contents will enable our readers to form an idea of the ground covered. Book I. (Object Lessons) contains forty lessons, grouped under six headings; lessons from simple natural phenomena such as the air, the sky, the sun, clouds and rain, wind and weather, &c.; round about the farm; lessons on the seasons; animals kept on the farm; and some useful minerals. Book II. contains forty lessons, grouped under lessons from animals, domestic and wild; lessons from birds; lessons from plants, and a number of miscellaneous lessons. The "Reader," of which the first part only is at present before us, is arranged in dialogue form and is to be used in conjunction with the corresponding volume of object lessons. We

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have nothing but praise for Mr. Murché's little books. They are the best of the kind that have hitherto come under our notice, and should go a long way towards facilitating that kind of teaching which all those who have taken part in the modern revival in rural education have been so anxious to see introduced into village schools. The great danger attending the use of such books is of course the tendency shown by teachers to make a fetish of the printed page. It is so much easier to teach didactically and to pump information into pupils from printed books than it is to develop their individual powers of observation and reasoning that extreme advocates of the "heuristic" method might take exception to the present volumes, as calculated to play too much into the hands of the teacher and to leave too little to the pupils themselves. But this danger is not confined particularly to rural education; it lurks in the pages of teachers' manuals in every branch of science, and if the publication of such works has injured the cause of true education it is more frequently the teachers than the authors who are at fault.

With respect to rural education in particular, it must not be forgotten that it has lagged far behind the education in towns, and that now—largely owing to the work of the Agricultural Education Committee—it is in a state of transition. The practical difficulties in the way of rational teaching in village schools are familiar to all who have attempted to grapple with the problem. Not the least of these difficulties is the imperfect education of the teachers themselves. Some of the technical instruction committees, as in Essex, have done good work through their normal classes, but much remains to be done before a body of teachers thoroughly trained in the requirements and in full sympathy with the objects of rural education can be called into existence. There are teachers in many such schools who are anxious to meet the new conditions now made possible through the enlightened policy of the Board of Education if they are helped in the way that Mr. Murché has attempted to help them by showing what there is to teach and how to teach it. If conducted rationally and scientifically, these object lessons will certainly accomplish the purpose for which they are written.

There is one little side issue to which the writer of this notice is glad of the present opportunity of calling attention. Now that the education of country children is making a serious departure in the right direction, the time seems ripe for inculcating that respect for living nature which is generally absent in the average child. Boys and girls are naturally destructive animals. The teachers in rural schools can do more than any other class of people to restrain and direct this tendency. They have to deal with children at the most impressionable period of their lives, and they have it in their power to point out exactly why wanton destruction is to be deprecated. The collecting of the common forms of animal and vegetable life for the purposes of study, *i.e.* for educational purposes, might be encouraged judiciously, but the ruthless destruction that accompanies the ordinary country ramble should be severely censured. If hordes of village school children are to be taken out into the country without proper restraint, the "nature study" is apt to degenerate into a mere collecting raid with no